

ABSTRACT

Methods for the preparation of long, dimensionally uniform, metallic nanowires that are removable from the surface on which they are synthesized. The methods include the selective electrodeposition of metal nanowires at step edges present on a stepped surface, such as graphite, from an aqueous solution containing a metal or metal oxide. Where a metal oxide is first deposited, the metal oxide nanowires are reduced via a gas phase reduction at elevated temperatures to metal nanowires. Alternatively, beaded or hybrid nanowires comprising a metal A into which nanoparticles of a metal B have been inserted may be prepared by first electrodepositing nanoparticles of metal B selectively along step edges of a stepped surface, capping these nanoparticles with a molecular layer of an organic ligand, selectively electrodepositing nanowire segments of metal A between nanoparticles of metal B and then heating the surface of the hybrid nanowire under reducing conditions to remove the ligand layer. In all three methods, the nanowires may be removed from the stepped surface by embedding the wires in a polymer film, and then peeling this film containing the embedded wires off of the stepped surface.